FPGA Software Installation and Firmware Update Instructions – RAVE 3.1, AMR



AMD Versal Plus Ryzen Mini-ITX Board

VPR-4616-MB

VPR-5050-MB

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SAPPHIRE - Embedded+ Initial Platform Install & Config

This page captures the steps to bring-up the Embedded+ platform configuration for the x86 Host and Versal SoC device enablement.

Hardware Setup:

Embedded+ system is comprised of a Versal SoC and a Ryzen SoC. The primary interfaces between these SoCs are PCIe and JTAG. Users interact with the Ryzen SoC through conventional means such as a keyboard and monitor, or via SSH once Linux is installed. Two UART ports are connected to the Versal SoC for debugging purposes only; they are not intended as the primary interface for Embedded+.

This documentation assumes the user possesses an Embedded+ system with OSPI pre-programmed at the factory, as this is the standard shipping configuration. The user will install Linux on the Ryzen X86 first, enabling subsequent interfacing with the Versal SoC.

ⓘ The OSPI binary prebuilts in this release targets VPR-4616, VPR-4616-sys, and VPR-5050. They do not target VPR-5050A as VPR-5050A has a different Versal HW configuration (DDR & MIO configs).

x86 Host OS

This section guide user to install Linux on X86, update OSPI and install AMI driver, tool and library

ⓘ Steps 1-3 are necessary for VPR-4616/5050-MB only. VPR-4616/5050-SYS has preloaded software and this section is not necessary.

If you have already done Ubuntu installation for XRT flow, skip to step 2, OSPI flashing.

1. Install the x86 host OS. Instructions and the image are available directly from Canonical:
   a Requires a USB stick, keyboard, monitor, mouse, and ethernet connection
   b Install instructions: https://ubuntu.com/tutorials/install-ubuntu-desktop#1-overview
   c OS image download: https://releases.ubuntu.com/jammy/
2. Update OSPI with AMR OSPI.
   a OSPI binary at https://account.amd.com/en/forms/downloads/xef.html?filename=emb-plus-ospi-amr-emb-plus-ve2302-amr-20261107132709.bin and follow the instruction of the link to update: GitHub – Xilinx/embpf-bootfw-update-tool. You will need to install git and hw_server.
   b After installation of the utility and its dependencies, the command to update OSPI is:

   sudo ./prog_spi.sh -d embplus -Vpv -i <path to emb-plus-ospi-amr-emb-plus-ve2302-amr-<version>.bin>

3. Install the AMI drivers on the x86 host.
   a Get the latest AMI *.deb files* from:
   https://account.amd.com/en/forms/downloads/xef.html?filename=ami_3.1.0-0.c21a01b6.20261107_amd64.deb

   https://account.amd.com/en/forms/downloads/xef.html?filename=libami_3.1.0-0.c21a01b6.20261107_amd64.deb

   https://account.amd.com/en/forms/downloads/xef.html?filename=amitool_3.1.0-0.c21a01b6.20261107_amd64.deb

   b Move *.deb packages to the Embedded+ platform running Ubuntu 22.04

   c Install the AMI driver, tool and library package with the following, and install any dependencies that's required:

Install AMI driver
sudo dpkg -i ami_3.1.0-0.c21a01b6.20261107_amd64.deb sudo dpkg -i libami_3.1.0-0.c21a01b6.20261107_amd64.deb sudo dpkg -i amitool_3.1.0-0.c21a01b6.20261107_amd64.deb

   d The previous step may take some time as it will build the driver locally on target. After it completes verify that the drivers are installed correctly using: *lsmod*

lsmod
test@test-desktop:~/Desktop$ sudo lsmod |grep -i ami [sudo] password for test: ami 237568 0

4. Reboot the system by doing a shut down (sudo poweroff) make sure that bootmode JP5 is set to the default (not populated, QSPI boot) before powering back on again.

Refer to https://github.com/Xilinx/amr for more information on how to build AMR firmware, software and how to use AMI tools.

On-target Test

The following are self-test that the user can run to test that the Versal and x86 host are set-up and configured correctly.

PCIe Connectivity

Use *lspci* to inspect if Versal device is present on PCIe bus.

lspci -vd 10ee:

```
test@test-desktop:~/Desktop$ sudo lspci -vd 10ee:
[sudo] password for test:
01:00.0 Processing accelerators: Xilinx Corporation Device 5710
        Subsystem: Xilinx Corporation Device 000e
        Flags: bus master, fast devsel, latency 0, IOMMU group 8
        Memory at f7000000 (64-bit, non-prefetchable) [size=8M]
        Memory at 1ff0010000 (64-bit, prefetchable) [size=64K]
        Memory at 1fe0000000 (64-bit, prefetchable) [size=256M]
        Capabilities: [40] Power Management version 3
        Capabilities: [60] MSI-X: Enable- Count=32 Masked-
        Capabilities: [70] Express Endpoint, MSI 00
        Capabilities: [100] Advanced Error Reporting
        Capabilities: [1c0] Secondary PCI Express
        Capabilities: [1f0] Virtual Channel
        Kernel driver in use: ami
        Kernel modules: ami

01:00.1 Processing accelerators: Xilinx Corporation Device 5711
        Subsystem: Xilinx Corporation Device 000e
        Flags: fast devsel, IOMMU group 8
        Memory at f6000000 (64-bit, non-prefetchable) [disabled] [size=16M]
        Memory at 1ff0000000 (64-bit, prefetchable) [disabled] [size=64K]
        Memory at 1fd0000000 (64-bit, prefetchable) [disabled] [size=256M]
        Capabilities: [40] Power Management version 3
        Capabilities: [60] MSI-X: Enable- Count=32 Masked-
        Capabilities: [70] Express Endpoint, MSI 00
        Capabilities: [100] Advanced Error Reporting
        Kernel modules: ami
```

AMI Platform Inspection

Use ami overview to see platform information.

ami_tool

```
test@test-desktop:~/Desktop$ sudo ami_tool overview
[sudo] password for test:

AMI
-------------------------------------------------------
Version        | 3.1.0  (0)
Branch
Hash           | c21a01b618be35511b2d88a8946bd8859639c713
Hash Date      | 20261029
Driver Version | 3.1.0  (0)


BDF     | Device         | Serial Number | UUID                                | AMC        | State
-------------------------------------------------------------------------------------------------
01:00.0 | RAVE-IVH-SAPPH | 52H2406000006 | 00000000000000000000000b67317a3 | 3.1.0  (0) | READY
```

Note that the UUID compatible with AMR flow release 3.1 is 00000000000000000000000b67317a3

AXI PCIE GPIO Test

The GPIO Driver for PCIe Interface test can be found at https://github.com/Xilinx/axi-gpio-pcie-module

Refer to https://github.com/Xilinx/axi-gpio-pcie-module for instructions to run GPIO tests.

Debug Tools – Versal Serial Console

The Versal serial console is connected to the Ryzen device on the motherboard. Therefore user can access the uart outputs from Ryzen. In Ubuntu, first download picocom:

Install picocom
sudo apt-get install picocom

Then user can access the com ports on commandline from Ubuntu:

Connect to APU serial output:
sudo picocom -b 115200 /dev/ttyUSB1

Connect to PLM/RPU serial output:
sudo picocom -b 115200 /dev/ttyUSB2

Repositories

The following links are the sources of this example artifacts
https://github.com/Xilinx/amr
https://github.com/Xilinx/axi-gpio-pcie-module

The following repository contains the Yocto meta layer for the Embedded+ platforms:
https://github.com/ilinx/meta-embedded-plus

Released Artifacts, Source Code, and License Information:
https://edf.docs.amd.com/en/latest/downloads-and-release-notes.html#embedded-images

FPGA (Xilinx) F/W Update

The VPR-4616/5050-MB and VPR-4616-SYS are both shipped with OSPI image. You can check their version with “ami_tools overview” command. Each release is based on a particular AMD tool version, and the released OSPI bin file contains a specific UUID the rest of the applications look for.

Release	AMD tool version	Bin file name	UUID
2.0	2025.1.1	emb-plus-ospi-emb-plus-ospi-amr-emb-plus-ve2302-amr-20250912165411.bin	00000000-0000-0000-0000-00009b62426
3.0	2026.1	emb-plus-ospi-amr-emb-plus-ve2302-amr-20260609231841.bin	00000000-0000-0000-0000-00009f1931ed
3.1	2026.2 EDF 2026.11	emb-plus-ospi-amr-emb-plus-ve2302-amr-20261107132709.bin	00000000-0000-0000-0000-0000b67317a3

Upgrading OSPI is necessary if the UUID does not match the release.

Please follow the instruction of the link for update
GitHub – Xilinx/embpf-bootfw-update-tool